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Brief Report

Socio-demographic risk factors associated with HIV infection in patients seeking medical advice in a rural hospital of India

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Significance for public health

India has approximately 2.4 millions of people living with HIV and two thirds live in rural areas. However, most of the studies on HIV in India have been performed in research centres or tertiary hospitals situated in urban areas. Studies in rural areas are difficult to perform due to isolation, poor communications, poverty and lack of institutions interested on doing research in rural regions. In this study, we describe risk factors associated with HIV infection in patients who were tested for HIV in a rural hospital of India. The findings of this study provide new information for understanding the HIV epidemic in rural India. Knowing the risk factors associated with HIV is essential for designing effective health programs aimed to achieve early diagnosis of HIV and prevent the transmission in the population.

Abstract

Despite the fact that two thirds of HIV infected people in India are rural residents, risk factors associated with HIV infection in rural areas are not well known. In this study we have collected socio-demographic data of 6406 patients who were tested for HIV infection in a rural hospital of India and we have investigated risk factors associated with HIV. In women the most important risk factor was being a widow and the risk was higher in younger than in older widows. Other variables found to be associated with HIV infection were age between 25 and 45 years in men, low education level (especially those who only completed primary education) and working in a field not related to agriculture in scheduled castes and men from scheduled tribes. The results of this study express the need for HIV screening of widows who live in rural areas of Indian States with high HIV prevalence.

Introduction

With 2.4 millions of people living with HIV,[1] India carries the largest burden of HIV in Asia and is the third country of the world in terms of HIV infected people.[2] Except for some northern states with high rates of injection drug use in the population, the route of transmission of HIV in India is mainly through sexual contacts.[2] Preventive measures of the Government of India for fighting against the spread of HIV have been based on the assumption that the primary drivers of the epidemic are high risk groups, commercial sex workers and men who have sex with men, who transmit the virus to a male bridge population. This bridge population, mainly migrants and truckers, extend the transmission to their female sexual partner and from them to their children.[2] Preventive interventions focused on high risk groups have attained impressive results reducing the incidence of HIV.[3] However, new data are suggesting that the HIV epidemic in India is evolving into a more generalized distribution in the population.[4,5] In order to keep the current decline of HIV incidence in India, we need a better understanding of the mechanisms of transmission and risk factors associated with HIV in the general population.

Although it is estimated that 67% of HIV infected people in India are rural residents,[2] risk factors associated with HIV infection in rural areas are not well known because most of the studies on HIV in India have been performed by institutions located in urban areas and there has been an underrepresentation of the rural population in previous epidemiological investigations.[6]

HIV infected patients who do not know to be infected consult health workers because of their medical problems. This is an optimal situation for performing a rapid HIV test and, if positive, for giving a proper counseling to the patient in order to prevent HIV transmission to others. The aim of this study is to investigate socio-demographic risk factors associated with HIV infection in a population of patients who were tested for HIV in a rural area of India.

Materials and Methods

This observational study was performed at the Rural Development Trust Hospital in Bathalapalli. The hospital is situated in a rural area of Anantapur district in Andhra Pradesh, which is the state with highest burden of HIV in India.[2] The hospital belongs to a nongovernmental organization called Rural Development Trust. Patients do not pay for medical consultations and the cost of medicines is partially waived to people belonging to scheduled castes (SC) and scheduled tribes (ST). SC community is the lowest caste in the traditional Hindu caste hierarchy and, therefore, suffers social and economic exclusion and disadvantage. ST community is generally geographically isolated with limited economic and social contact with the rest of the population. Both SC and ST communities have significant higher levels of poverty than other non-scheduled communities.[7] Other backward castes (OBC) are a collection of *intermediate* castes that were considered low in the traditional caste hierarchy, but above SC.[5] Other castes (OC), also called general class or forward castes, were considered above previous mentioned castes in the traditional Hindu hierarchy and do not qualify for any of the current positive discrimination schemes operated by the Government of India.

Between August 2nd 2007 and December 31st 2010, patients aged above 15 years who attended the outpatient clinics of the hospital and were tested for HIV infection as part of their routine care were counseled before and after the test and socio-demographic details were systematically collected. Following WHO recommendations for diagnosing HIV infection,[8] first a rapid HIV test was performed. If this test was non-reactive, not further HIV tests were performed. If the test was

reactive, two other HIV assays were performed for confirmation of HIV infection.

Logistic regression was used for the multivariable analysis of factors associated with having HIV infection using Stata Statistical Software (Stata Corporation, Rel. 11, College Station, Texas, USA).[9] Several interactions were found between gender and communities in the initial logistic regression model so the models were run separately by these variables. The study was approved by the ethical committee of the Institutional Review Board of Rural Development Trust.

Results

The study included 6406 patients who were tested for HIV during the period of the study. Characteristics of the patients by community and HIV prevalence are presented in Table 1. ST and SC communities had lower level of education and higher proportion of agricultural workers than other communities. Multivariable analysis of risk factors associated with HIV infection separated by gender and community is presented in Table 2. As a predictor of HIV infection, age was more important for males than for females. It was observed higher odds ratios in people aged 25 to 45 years in males from all communities. Working in a field not related to agriculture was significantly related to having HIV in SC and in males from ST. In general, people with lower levels of education had higher odds ratios for HIV infection. Being single was a protective factor for having HIV infection in all communities except in males from OC, although this was not statistically significant. By far, the most important factor associated with HIV infection in women was being a widow. In all cases, the HIV status of widows' husbands was not known. Compared to non-widowed women, odds ratios for HIV infection of widows aged 15-25 years, 25-35 years, 35-45 years and above 45 years were 7.09 (95% confidence interval, 2.40-20.94), 6.60 (95% confidence interval, 3.66-11.91), 6.62 (95% confidence interval, 3.82-11.47) and 2.03 (95% confidence interval, 1.07-3.86) respectively in multivariable logistic regression models adjusted by community, occupation and education.

Discussion

Our results show that widows who seek medical advice in a rural area with high HIV prevalence have a high risk of being HIV infected and the risk is inversely related to the age of the widow. Female widowhood has been recognized as one of the most important risk factors for HIV infection in India in at least two previous population-based studies.[4,5] The most important route of HIV transmission in India is through sexual contacts and more than 90% of infected women acquire the infection from their husbands.[2] It has been observed that HIV is an important cause of death among young men in Indian States with higher prevalence of HIV.[10] The reduction of the HIV prevalence in these States was followed by a reduction of all-cause mortality in men aged 25-34 years.[10] Since husbands acquire HIV earlier, they are likely to die before their wives, even if both members of the couple are infected. In many cases, these HIV positive widows are left in deplorable situations due to illiteracy and lack of emotional and economical support.[11] It has been observed that these poor conditions induce them to engage in sexual activity in exchange for emotional and financial help and, therefore, continuing the spread of the disease.[11,12] Specific programs focused on HIV screening and providing economical and psychological support of HIV positive widows are urgently needed in India.

As seen in other cross sectional studies, HIV infection was more common in young adults in both sexes but age was more important for men than for women.[4,5] People from SC and males from ST who worked in the agriculture sector had lower risk of having a positive HIV test, perhaps because they are less likely to have high risk sexual contacts than men whose job involves higher regular mobility.[2]

Previous studies have shown an association between lower education level and HIV infection.[4,5] However, in our study the highest risk for HIV infection was observed in those who only completed primary education. In general, these patients abandoned the school for working. New studies on the sexual behavior, sexual vulnerability and migration patterns in this group may clarify this finding.

The study has some limitations. HIV test was requested when the treating clinician suspected that the patient could be HIV infected. This

Table 1. General characteristics of the patients by community and HIV prevalence.

	Total		Other castes		Other backward castes		Scheduled castes		Scheduled tribes		HIV infection	
	N	%	N	%	N	%	N	%	N	%	N	%
Age (years)												
15-25	1276	19.9	157	14.8	415	19.2	526	22.8	178	20.1	132	10.3
25-35	2126	33.2	307	29	692	32.1	799	34.7	328	37.1	375	17.6
35-45	1665	26.0	294	27.8	571	26.4	564	24.5	236	26.7	259	15.6
> 45	1339	20.9	300	28.4	481	22.3	415	18	143	16.2	139	10.4
Sex												
Female	3344	52.2	560	52.9	1093	50.6	1190	51.6	501	56.6	395	11.8
Male	3062	47.8	498	47.1	1066	49.4	1114	48.4	384	43.4	510	16.7
Occupation												
Agriculture	4561	71.2	595	56.2	1466	67.9	1792	77.8	708	80	628	13.8
Housekeeper	320	5.0	113	10.7	123	5.7	59	2.6	25	2.8	36	11.3
Others	1525	23.8	350	33.1	570	26.4	453	19.7	152	17.2	241	15.8
Education												
Secondary/higher	1598	24.9	371	35.1	560	25.9	501	21.7	166	18.8	193	12.1
Primary	1293	20.2	269	25.4	487	22.6	391	17	146	16.5	242	18.7
No education	3515	54.9	418	39.5	1112	51.5	1412	61.3	573	64.7	470	13.4
Marital status												
Single	384	6.0	64	6	124	5.7	153	6.6	43	4.9	25	6.5
Married	5769	90.1	959	90.6	1956	90.6	2052	89.1	802	90.6	805	14
Widowed	253	3.9	35	3.3	79	3.7	99	4.3	40	4.5	75	29.6
Total	6406	100	1058	100	2159	100	2304	100	885	100	905	14.1

Table 2. Multivariable analysis of factors associated with HIV infection by community and gender.

	Other castes						Other backward castes					
	Females			Males			Females			Males		
	Proportion (%)	aOR	(95% CI)	Proportion (%)	aOR	(95% CI)	Proportion (%)	aOR	(95% CI)	Proportion (%)	aOR	(95% CI)
Age (years)												
15-25	9/92 (9.8)	1	Reference	4/65 (6.2)	1	Reference	31/216 (14.4)	1	Reference	22/199 (11.1)	1	Reference
25-35	27/179 (15.1)	1.31	(0.57 - 3.01)	28/128 (21.9)	7.06*	(1.90 - 26.19)	60/398 (15.1)	0.79	(0.49 - 1.29)	86/294 (29.3)	2.55#	(1.48 - 4.41)
35-45	15/165 (9.1)	0.64	(0.26 - 1.56)	30/129 (23.3)	7.72*	(2.00 - 29.87)	44/302 (14.6)	0.68	(0.40 - 1.15)	60/269 (22.3)	1.67	(0.94 - 2.97)
> 45	10/124 (8.1)	0.47	(0.17 - 1.27)	19/176 (10.8)	2.91	(0.74 - 11.49)	20/177 (11.3)	0.31#	(0.16 - 0.61)	29/304 (9.5)	0.61	(0.32 - 1.15)
Occupation												
Agriculture	42/310 (13.5)	1	Reference	49/285 (17.2)	1	Reference	113/773 (14.6)	1	Reference	130/693 (18.8)	1	Reference
Housekeeper	8/113 (7.1)	0.54	(0.24 - 1.21)	0/0	-	-	17/122 (13.9)	1.35	(0.75 - 2.43)	0/1 (0)	-	-
Others	11/137 (8)	0.63	(0.30 - 1.33)	32/213 (15)	0.89	(0.53 - 1.50)	25/198 (12.6)	1.29	(0.77 - 2.14)	67/372 (18)	1.03	(0.72 - 1.48)
Education												
Secondary/higher	10/144 (6.9)	1	Reference	36/227 (15.9)	1	Reference	16/206 (7.8)	1	Reference	58/354 (16.4)	1	Reference
Primary	17/132 (12.9)	1.74	(0.74 - 4.06)	26/137 (19)	1.56	(0.85 - 2.87)	35/190 (18.4)	3.42#	(1.75 - 6.70)	69/297 (23.2)	1.52	(1.00 - 2.32)
No education	34/284 (12)	1.51	(0.68 - 3.36)	19/134 (14.2)	0.98	(0.52 - 1.87)	104/697 (14.9)	2.49*	(1.34 - 4.63)	70/415 (16.9)	1.06	(0.70 - 1.62)
Marital status												
Single	0/21 (0)	-	-	6/43 (14)	2.6	(0.78 - 8.71)	0/29 (0)	-	-	7/95 (7.4)	0.42*	(0.18 - 1.00)
Married	53/505 (10.5)	1	Reference	75/454 (16.5)	1	Reference	126/985 (12.8)	1	Reference	190/971 (19.6)	1	Reference
Widowed	8/34 (23.5)	3.30*	(1.34 - 8.11)	0/1 (0)	-	-	29/79 (36.7)	6.03#	(3.46 - 10.51)	0/0	-	-
Total	61/560 (10.9)			81/498 (16.3)			155/1093 (14.2)			197/1066 (18.5)		

	Scheduled castes						Scheduled tribes					
	Females			Males			Females			Males		
	Proportion (%)	aOR	(95% CI)	Proportion (%)	aOR	(95% CI)	Proportion (%)	aOR	(95% CI)	Proportion (%)	aOR	(95% CI)
Age (years)												
15-25	30/281 (10.7)	1	Reference	21/245 (8.6)	1	Reference	10/111 (9)	1	Reference	5/67 (7.5)	1	Reference
25-35	52/438 (11.9)	1	(0.60 - 1.65)	76/361 (21.1)	2.34°	(1.30 - 4.24)	23/204 (11.3)	1.17	(0.51 - 2.65)	23/124 (18.5)	2.82	(0.89 - 8.91)
35-45	34/315 (10.8)	0.79	(0.45 - 1.37)	50/249 (20.1)	2.25*	(1.20 - 4.21)	10/133 (7.5)	0.67	(0.25 - 1.79)	16/103 (15.5)	2.27	(0.69 - 7.53)
> 45	14/156 (9)	0.44*	(0.21 - 0.93)	27/259 (10.4)	1.04	(0.52 - 2.07)	6/53 (11.3)	0.64	(0.18 - 2.28)	14/90 (15.6)	2.24	(0.66 - 7.64)
Occupation												
Agriculture	107/1021 (10.5)	1	Reference	108/771 (14)	1	Reference	40/421 (9.5)	1	Reference	39/287 (13.6)	1	Reference
Housekeeper	7/59 (11.9)	1.41	(0.60 - 3.29)	0/0	-	-	4/25 (16)	2.04	(0.62 - 6.76)	0/0	-	-
Others	16/110 (14.5)	2.03*	(1.06 - 3.87)	66/343 (19.2)	2.12#	(1.43 - 3.13)	5/55 (9.1)	0.66	(0.22 - 1.96)	19/97 (19.6)	2.06*	(1.04 - 4.08)
Education												
Secondary/higher	11/141 (7.8)	1	Reference	41/360 (11.4)	1	Reference	7/52 (13.5)	1	Reference	14/114 (12.3)	1	Reference
Primary	20/148 (13.5)	2.04	(0.89 - 4.66)	54/243 (22.2)	2.61#	(1.60 - 4.26)	5/68 (7.4)	0.49	(0.13 - 1.78)	16/78 (20.5)	2.21	(0.91 - 5.33)
No education	99/901 (11)	1.56	(0.73 - 3.34)	79/511 (15.5)	1.81*	(1.12 - 2.90)	37/381 (9.7)	0.65	(0.24 - 1.77)	28/192 (14.6)	1.44	(0.63 - 3.27)
Marital status												
Single	1/33 (3)	0.23	(0.03 - 1.82)	8/120 (6.7)	0.58	(0.24 - 1.42)	1/11 (9.1)	0.99	(0.11 - 9.28)	2/32 (6.3)	0.64	(0.11 - 3.59)
Married	102/1058 (9.6)	1	Reference	166/994 (16.7)	1	Reference	37/450 (8.2)	1	Reference	56/352 (15.9)	1	Reference
Widowed	27/99 (27.3)	4.71#	(2.74 - 8.11)	0/0	-	-	11/40 (27.5)	5.71#	(2.33 - 13.96)	0/0	-	-
Total	130/1190 (10.9)			174/1114 (15.6)			49/501 (9.8)			58/384 (15.1)		

aOR, adjusted odds ratio; CI, confidence interval. *P<0.05; °P<0.01; #P<0.001.

explains the high HIV prevalence found in our study, which should not extrapolated to the general population. Population based well designed studies are needed to confirm our findings, although these types of studies are expensive and difficult to perform in rural areas. Moreover, we do not have information about the HIV status of the husbands of the HIV infected widows. We cannot know whether these widows acquired HIV from their husbands or after their husbands' death.

In conclusion, the findings of this study indicate the complexity of the HIV epidemic in India. There were important differences in HIV associated risk factors between men and women and between the different Indian communities. Young widows who seek medical advice in rural areas of India with high prevalence of HIV have high risk of being HIV infected. We also found that lower education levels and working in a field not related to agriculture were factors associated with higher risk of HIV infection in this rural setting. The results of this study can help to design health programs aimed to achieve early diagnosis of HIV in rural health facilities of Indian States with high HIV prevalence.

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